

JEE Main April 2025
Question Paper With Text Solution
07 April | Shift-2

MATHEMATICS



JEE Main & Advanced | XI-XII Foundation | VI-X Pre-Foundation

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**JEE MAIN APRIL 2025 | 07TH APRIL SHIFT-2****SECTION – A**

Question ID : 6034212218

1. A bag contains 19 unbiased coins and one coin with head on both sides. One coin drawn at random is tossed and head turns up. If the probability that the drawn coin was unbiased is $\frac{m}{n}$, $\gcd(m, n) = 1$, then $n^2 - m^2$ is equal to :

(1) 64 (2) 80 (3) 60 (4) 72

Ans. Official answer NTA(2)

Sol.

Question ID : 6034212213

2. Let the system of equations

$$x + 5y - z = 1$$

$$4x + 3y - 3z = 7$$

$$24x + y + \lambda z = \mu$$

$\lambda, \mu \in \mathbb{R}$, have infinitely many solutions. Then the number of the solutions of this system, if x, y, z are integers and satisfy $7 \leq x + y + z \leq 77$, is :

(1) 5 (2) 3 (3) 6 (4) 4

Ans. Official answer NTA(2)

Sol.

Question ID : 6034212224

3. If the equation of the line passing through the point $\left(0, -\frac{1}{2}, 0\right)$ and perpendicular to the lines $\vec{r} = \lambda(\hat{i} + a\hat{j} + b\hat{k})$

and $\vec{r} = (\hat{i} - \hat{j} - 6\hat{k}) + \mu(-b\hat{i} + \hat{j} + 5\hat{k})$ is $\frac{x-1}{-2} = \frac{y+4}{d} = \frac{z-c}{-4}$, then $a + b + c + d$ is equal to :

(1) 14 (2) 10 (3) 13 (4) 12

Ans. Official answer NTA(1)

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**Sol.**

Question ID : 6034212219

4. If the orthocenter of the triangle formed by the lines $y = x + 1$, $y = 4x - 8$ and $y = mx + c$ is at $(3, -1)$, then $m - c$ is :

(1) -2 (2) 4 (3) 0 (4) 2

Ans. Official answer NTA(3)**Sol.**

Question ID : 6034212212

5. If the locus of $z \in \mathbb{C}$, such that $\operatorname{Re}\left(\frac{z-1}{2z+i}\right) + \operatorname{Re}\left(\frac{\bar{z}-1}{2\bar{z}-i}\right) = 2$, is a circle of radius r and center (a, b) , then $\frac{15ab}{r^2}$ is equal to :

(1) 12 (2) 24 (3) 18 (4) 16

Ans. Official answer NTA(3)**Sol.**

Question ID : 6034212225

6. Consider the lines $L_1 : x - 1 = y - 2 = z$ and $L_2 : x - 2 = y = z - 1$. Let the feet of the perpendiculars from the point $P(5, 1, -3)$ on the lines L_1 and L_2 be Q and R respectively. If the area of the triangle PQR is A , then $4A^2$ is equal to :

(1) 151 (2) 143 (3) 139 (4) 147

Ans. Official answer NTA(4)**Sol.**

Question ID : 6034212222

7. The number of solutions of the equation $\cos 2\theta \cos \frac{\theta}{2} + \cos \frac{5\theta}{2} = 2 \cos^3 \frac{5\theta}{2}$ in $\left[-\frac{\pi}{2}, \frac{\pi}{2}\right]$ is :

(1) 5 (2) 7 (3) 9 (4) 6

Ans. Official answer NTA(2)**MATRIX JEE ACADEMY****Office : Piprali Road, Sikar (Raj.) | Ph. 01572-241911****Website : www.matrixedu.in ; Email : smd@matrixacademy.co.in**

Sol.

Question ID : 6034212210

8. If the range of the function $f(x) = \frac{5-x}{x^2-3x+2}$, $x \neq 1, 2$ is $(-\infty, \alpha] \cup [\beta, \infty)$, then $\alpha^2 + \beta^2$ is equal to :
- (1) 188 (2) 190 (3) 194 (4) 192

Ans. Official answer NTA(3)**Sol.**

Question ID : 6034212215

9. If the sum of the second, fourth and sixth terms of a G.P. of positive terms is 21 and the sum of its eighth, tenth and twelfth terms is 15309, then the sum of its first nine terms is :
- (1) 755 (2) 757 (3) 760 (4) 750

Ans. Official answer NTA(2)**Sol.**

Question ID : 6034212223

10. Let $\vec{a}$ and $\vec{b}$ be the vectors of the same magnitude such that $\frac{|\vec{a} + \vec{b}| + |\vec{a} - \vec{b}|}{|\vec{a} + \vec{b}| - |\vec{a} - \vec{b}|} = \sqrt{2} + 1$. Then $\frac{|\vec{a} + \vec{b}|^2}{|\vec{a}|^2}$ is :
- (1) $2 + 4\sqrt{2}$ (2) $1 + \sqrt{2}$ (3) $2 + \sqrt{2}$ (4) $4 + 2\sqrt{2}$

Ans. Official answer NTA(3)**Sol.**

Question ID : 6034212220

11. Let the length of a latus rectum of an ellipse $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$ be 10. If its eccentricity is the minimum value of the function $f(t) = t^2 + t + \frac{11}{12}$, $t \in \mathbb{R}$, then $a^2 + b^2$ is equal to :
- (1) 120 (2) 126 (3) 125 (4) 115

Ans. Official answer NTA(2)**MATRIX JEE ACADEMY****Office : Piprali Road, Sikar (Raj.) | Ph. 01572-241911****Website : www.matrixedu.in ; Email : smd@matrixacademy.co.in**

Sol.

Question ID : 6034212216

12. Let p be the number of all triangles that can be formed by joining the vertices of a regular polygon P of n sides and q be the number of all quadrilaterals that can be formed by joining the vertices of P . If $p + q = 126$, then the eccentricity of the ellipse $\frac{x^2}{16} + \frac{y^2}{n} = 1$ is :

- (1) $\frac{3}{4}$ (2) $\frac{1}{2}$ (3) $\frac{1}{\sqrt{2}}$ (4) $\frac{\sqrt{7}}{4}$

Ans. Official answer NTA(3)**Sol.**

Question ID : 6034212211

13. The number of real roots of the equation $x|x-2| + 3|x-3| + 1 = 0$ is :

- (1) 2 (2) 4 (3) 3 (4) 1

Ans. Official answer NTA(4)**Sol.**

Question ID : 6034212214

14. Let a_n be the n^{th} term of an A.P. If $S_n = a_1 + a_2 + a_3 + \dots + a_n = 700$, $a_6 = 7$ and $S_7 = 7$, then a_n is equal to :

- (1) 56 (2) 70 (3) 65 (4) 64

Ans. Official answer NTA(4)**Sol.**

Question ID : 6034212227

15. Let $y = y(x)$ be the solution of the differential equation $(x^2 + 1)y' - 2xy = (x^4 + 2x^2 + 1)\cos x$, $y(0) = 1$. Then

$\int_{-3}^3 y(x) dx$ is :

- (1) 36 (2) 18 (3) 24 (4) 30

Ans. Official answer NTA(3)**MATRIX JEE ACADEMY****Office : Piprali Road, Sikar (Raj.) | Ph. 01572-241911****Website : www.matrixedu.in ; Email : smd@matrixacademy.co.in**

**Sol.**

Question ID : 6034212217

16. Let a random variable X takes values 0, 1, 2, 3 with $P(X=0) = P(X=1) = p$, $P(X=2) = P(X=3)$ and $E(X^2) = 2E(X)$. Then the value of $8p - 1$ is :

(1) 3 (2) 0 (3) 1 (4) 2

Ans. Official answer NTA (4)**Sol.**

Question ID : 6034212228

17. If the area of the region $\{(x, y) : 1 + x^2 \leq y \leq \min\{x + 7, 11 - 3x\}\}$ is A , then $3A$ is equal to :

(1) 46 (2) 47 (3) 49 (4) 50

Ans. Official answer NTA (4)**Sol.**

Question ID : 6034212209

18. Let $A = \{(\alpha, \beta) \in \mathbb{R} \times \mathbb{R} : |\alpha - 1| \leq 4 \text{ and } |\beta - 5| \leq 6\}$
and $B = \{(\alpha, \beta) \in \mathbb{R} \times \mathbb{R} : 16(\alpha - 2)^2 + 9(\beta - 6)^2 \leq 144\}$.

Then :

(1) $B \subset A$ (2) neither $A \subset B$ nor $B \subset A$
(3) $A \subset B$ (4) $A \cup B = \{(x, y) : -4 \leq x \leq 4, -1 \leq y \leq 11\}$

Ans. Official answer NTA (1)**Sol.**

Question ID : 6034212221

19. Let e_1 and e_2 be the eccentricities of the ellipse $\frac{x^2}{b^2} + \frac{y^2}{25} = 1$ and the hyperbola $\frac{x^2}{16} - \frac{y^2}{b^2} = 1$, respectively. If $b < 5$ and $e_1 e_2 = 1$, then the eccentricity of the ellipse having its axes along the coordinate axes and passing through all four foci (two of the ellipse and two of the hyperbola) is :



(1) $\frac{3}{5}$

(2) $\frac{\sqrt{3}}{2}$

(3) $\frac{\sqrt{7}}{4}$

(4) $\frac{4}{5}$

Ans. Official answer NTA(1)**Sol.**

Question ID : 6034212226

20. Let $f: \mathbb{R} \rightarrow \mathbb{R}$ be a polynomial function of degree four having extreme values at $x = 4$ and $x = 5$. If $\lim_{x \rightarrow 0} \frac{f(x)}{x^2} = 5$, then $f(2)$ is equal to :

(1) 8

(2) 12

(3) 10

(4) 14

Ans. Official answer NTA(3)**Sol.****SECTION - B**

Question ID : 6034212229

21. The sum of the series $2 \times 1 \times {}^{20}C_4 - 3 \times 2 \times {}^{20}C_5 + 4 \times 3 \times {}^{20}C_6 - 5 \times 4 \times {}^{20}C_7 + \dots + 18 \times 17 \times {}^{20}C_{20}$ is equal to _____.

Ans. Official answer NTA(34)**Sol.**

Question ID : 6034212233

22. If the function $f(x) = \frac{\tan(\tan x) - \sin(\sin x)}{\tan x - \sin x}$ is continuous at $x = 0$, then $f(0)$ is equal to _____.

Ans. Official answer NTA(2)**Sol.**

Question ID : 6034212231

23. For $t > -1$, let β_t and β_t be the roots of the equation $\left((t+2)^{\frac{1}{7}} - 1\right)x^2 + \left((t+2)^{\frac{1}{6}} - 1\right)x + \left((t+2)^{\frac{1}{21}} - 1\right) = 0$.

If $\lim_{t \rightarrow -1^+} \alpha_t = a$ and $\lim_{t \rightarrow -1^+} \beta_t = b$, then $72(a+b)^2$ is equal to _____.

Ans. Official answer NTA(98)**MATRIX JEE ACADEMY****Office : Piprali Road, Sikar (Raj.) | Ph. 01572-241911****Website : www.matrixedu.in ; Email : smd@matrixacademy.co.in**

**Sol.**

Question ID : 6034212230

24. Let the lengths of the transverse and conjugate axes of a hyperbola in standard form be $2a$ and $2b$, respectively, and one focus and the corresponding directrix of this hyperbola be $(-5, 0)$ and $5x + 9 = 0$, respectively. If the product of the focal distances of a point $(\alpha, 2\sqrt{5})$ on the hyperbola is p , then $4p$ is equal to _____.

Ans. Official answer NTA (189)**Sol.**

Question ID : 6034212232

25. If $\int \left(\frac{1}{x} + \frac{1}{x^3} \right) \left(\sqrt[23]{3x^{-24} + x^{-26}} \right) dx = -\frac{\alpha}{3(\alpha+1)} (3x^\beta + x^\gamma)^{\frac{\alpha+1}{\alpha}} + C$, $x > 0$, $(\alpha, \beta, \gamma \in \mathbb{Z})$, where C is the constant of integration, then $\alpha + \beta + \gamma$ is equal to _____.

Ans. Official answer NTA (19)**Sol.**